Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Parts 2.106 and 25.202	)	
of the Commission's Rules to Permit	)	
Operation of NGSO FSS Systems	)	RM No. 9147
Co-Frequency with GSO and Terrestrial	)	
Systems in the 10.7-12.7 GHz,	)	
12.75-13.25 GHz, 13.75-14.5 GHz,	)	
and 17.3-17.8 GHz Bands, and to	)	
Establish Technical Rules Governing	)	
NGSO FSS Operations in these Bands	)	

SURREPLY OF SKYBRIDGE

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Summary

Diversified Communication Engineering, Inc. ("DCE") argues in its Reply Comments that the rules proposed by SkyBridge would foreclose the use of the 12.2-12.7 GHz band by its fixed terrestrial microwave "Northpoint" system, which apparently is designed to allow DBS subscribers to receive local broadcast television signals terrestrially. Based on no technical assessment whatsoever, and without providing any operational discussion of the Northpoint system, DCE concludes that Northpoint and SkyBridge are mutually exclusive.

SkyBridge has endeavored to interpolate from the few technical facts publicly available regarding the Northpoint system an analysis of how that system actually would operate. The results of this analysis suggest that SkyBridge will not cause interference to Northpoint, and that existing DBS operators should be far more concerned regarding DCE's plans than should SkyBridge.

In sum, DCE proposes a system that appears to be incapable of sharing spectrum with even the DBS licensees already operating in the subject band. DCE's Reply Comments fail to offer any credible reason for delaying consideration of the issues raised in the Petition. The public interest would be greatly served by an expeditious rulemaking to permit NGSO FSS systems to operate co-frequency with GSO and terrestrial services at Ku-band, subject to regulations which ensure protection of those services.

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SURREPLY OF SKYBRIDGE

SkyBridge L.L.C. ("SkyBridge") hereby responds to the "Reply Comments" filed by Diversified Communication Engineering, Inc. ("DCE") in the above-captioned proceeding on September 11, 1997 (the "DCE Reply Comments").

SkyBridge's July 3, 1997, petition for rulemaking (the "Petition") was placed on Public Notice on July 28, 1997,[1/] and comments and oppositions were filed on August 27, 1997, by 11 parties. As detailed in SkyBridge's "Motion for Leave to File Surreply," being filed simultaneously herewith, DCE chose, for whatever reason, not to file initial comments, but chose instead to file only its Reply Comments, which contain a host of unsubstantiated claims and assertions. Below, SkyBridge provides an analysis of DCE's Reply Comments, and demonstrates that DCE's proposed use of a portion of the Ku-band provides no basis whatsoever for delaying the adoption of

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1/ See Public Notice, Report No. 2213.

regulations to facilitate the development of a new generation of NGSO satellite systems capable of sharing spectrum with GSO and terrestrial systems.

I. INTRODUCTION

In its Petition, SkyBridge requested that the Commission initiate a rulemaking proceeding to amend Sections 2.106 and 25.202 of its Rules to permit non-geostationary orbit ("NGSO") Fixed-Satellite Service ("FSS") systems to operate in the U.S. co-frequency with geostationary orbit ("GSO") and terrestrial systems in, inter alia, the 12.2-12.7 GHz band, and to establish technical rules governing NGSO FSS operations in the subject bands.[2/] DCE argues in its Reply Comments that the rules proposed by SkyBridge would foreclose the use of the 12.2-12.7 GHz band by its fixed terrestrial microwave "Northpoint" system, which, according to DCE, "will allow DBS subscribers to receive local broadcast television signals over existing DBS reception equipment without interference to the DBS service." DCE Reply Comments at 2. DCE has obtained an experimental license from the FCC to test the Northpoint system.[3/]

2/ The rule changes proposed in the Petition would facilitate the establishment of a new generation of low Earth orbit ("LEO") satellite systems, which are capable of operating co-frequency with Ku-band GSO and terrestrial FS licensees. One example of such a system is the "SkyBridge System." See Application of SkyBridge L.L.C. for Authority to Launch and Operate a Global Network of Low Earth Orbit Communications Satellites Providing Broadband Services in the Fixed Satellite Service (filed February 28, 1997, File No. 48-SAT-P/LA-97) (the "Application"), and amendment thereto (filed July 3, 1997, File No. 89-SAT-AMEND-97) (the "Amendment"). The Application and Amendment were placed on Public Notice, Report No. SPB-98, released on August 28, 1997.

3/ WA2XMY, File No. 5020-EX-PL-95, July 8, 1997.

Based on no technical analysis whatsoever, and without providing any operational details regarding the Northpoint system, DCE concludes that Northpoint and SkyBridge are mutually exclusive, and that the public interest would be better served by deployment of the Northpoint system than by deployment of a new generation of frequency sharing satellite systems. DCE Reply Comments at 2. Obviously, unsubstantiated claims such as DCE's inherently lack credibility and can easily be dismissed out of hand.

However, SkyBridge has, throughout both this proceeding and the one related to its Application, endeavored to provide a reasoned technical response to any relevant question raised regarding its system. Thus, in an effort to ensure that the Commission has all relevant facts before it in this proceeding, the discussion below takes the few technical facts publicly available regarding the Northpoint system and provides at least a threshold analysis of how that system actually would operate. The results of this analysis suggest that SkyBridge will not cause interference to Northpoint, and that existing DBS operators should be far more concerned regarding DCE's plans than should SkyBridge.

II. REVIEW OF THE NORTHPOINT SYSTEM

As noted above, DCE provided little illumination in its Reply Comments on the operation of its Northpoint system, or even as to the basis for its claims. This problem is compounded by the fact that DCE sought and received

confidential treatment of its experimental license application; little technical information can be gleaned from the face of the license.[4/]

In its Reply Comments, DCE emphasized that its Northpoint technology is patented. SkyBridge has obtained a copy of what appears to be the sole United States patent awarded to DCE for the Northpoint system (the "DCE Patent"),[5/] and the description of the Northpoint system in the patent is at odds with statements in DCE's Reply Comments. Obviously, this complicates an assessment of DCE's claims.[6/]

Given the lack of substantive support for DCE's technical conclusions, and given the conflict between the DCE Reply Comments and the DCE Patent, it is difficult to take DCE's pleading seriously. Nonetheless, using clues as to the nature of the Northpoint system contained in the DCE Reply Comments and its experimental license, SkyBridge has attempted below to make reasonable assumptions regarding the Northpoint architecture, and thereby assess the potential impact of SkyBridge on Northpoint, and vice versa.[7/] Furthermore, SkyBridge has considered the alternative

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[4/] By putting its technical merits at issue in the instant proceeding, it reasonably can be concluded that DCE has waived its rights under the prior grant of confidentiality.

[5/] U.S. Patent No. 5,483,663, issued January 9, 1996, to Saleem Tawil and assigned to Diversified Communication Engineering, Inc., entitled "System for Providing Local Originating Signals with Direct Broadcast Satellite Television Signals."

[6/] DCE filed for the DCE Patent in 1994. If the scheme described in the patent is outdated and does not reflect DCE's current plans, it is not clear why DCE touts that its technology is "patented."

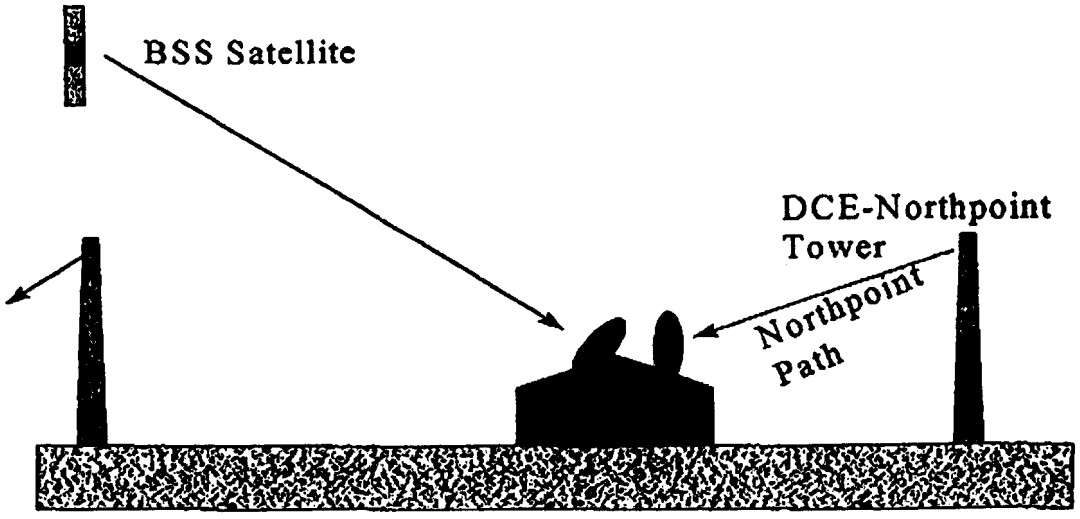
[7/] To the extent any of its assumptions are in error, SkyBridge would welcome (continued...)

technical scheme described in the DCE Patent. The two Northpoint scenarios have been analyzed separately, and in both cases, it is demonstrated that SkyBridge will not interfere with Northpoint. Furthermore, it is shown that the Northpoint system presents a substantial interference threat to DBS operators (as opposed to the completely benign nature of the SkyBridge system). The viability of DCE's system appears to be questionable, at best.

A. The Northpoint System According to the DCE Reply Comments

DCE states that "Northpoint reuses DBS spectrum without interference through a combination of techniques including precise directionalization of the terrestrial signals relative to the look angle of DBS receivers in any particular market." DCE Reply Comments at 2 (emphasis added). Therefore, (in contrast to the system described in the DCE Patent, as discussed below) it appears that Northpoint operates on a co-frequency, co-geographic basis with DBS, hoping to avoid interference by exploiting the directionality of the DBS consumer earth stations. It can be assumed that the configuration is approximately that depicted below, with the Northpoint transmitters located behind at least some of the DBS dishes:

7/ (...continued)
correction by Northpoint.



DCE's experimental license specifies operation in the 12.2-12.7 GHz frequency band with a carrier bandwidth of 30 MHz and an ERP of 1 kW (30 dBW). Using the dipole-to-isotropic conversion of 2.15 dB, this translates into a Northpoint EIRP of 32.15 dBW.

DCE states in its Reply Comments that Northpoint reception will be possible "over existing DBS reception equipment." DCE Reply Comments at 2. It is not clear what this means. Obviously, in the configuration depicted above, a second antenna will be required to receive the Northpoint signal. Based on DCE's reference to "existing DBS equipment", and in the absence of other information, this receiver will be assumed to be a 45 cm DBS dish. (As discussed below, the DCE Patent suggests use of a horn or slot antenna, but the DCE Patent technology is quite different from that hinted at in the DCE Reply Comments. In any case, the conclusions will not differ dramatically if another type of Northpoint receiving antenna is assumed.)

1. Impact of SkyBridge on Northpoint

Tables C-12 and C-13 of Exhibit C to the SkyBridge Amendment[8/] calculated the I/N levels generated by SkyBridge to FS stations. These computations, performed using 1.8 meter FS antennas, demonstrated that the interference from SkyBridge will not be noticeable. The use of a 45 cm Northpoint antenna in place of a 1.8 m antenna leads to a reduction of 12 dB in the interference received from SkyBridge.[9/] Such I/N ratio should not impact the Northpoint quality of service and/or link availability.

2. Impact of Northpoint on SkyBridge

SkyBridge user terminals track the SkyBridge satellites, and from time to time may point toward the Northpoint transmitters. Therefore, the Northpoint transmissions may potentially interfere with the reception of SkyBridge user terminals.

To quantify this possibility, the following computation was performed for the SkyBridge "professional" class of user terminals, assuming a worst case 10° discrimination between the SkyBridge user terminal pointing direction and the Northpoint transmitter direction.[10/] A 10 km separation distance between the SkyBridge user terminal and the Northpoint transmitter was used, a far from worst-case assumption.

8/ See note 2 supra.

9/ The use by Northpoint of a horn or slot antenna will reduce the gain by an additional 26 dB (for 38 dB total), as shown in Section B below.

10/ Such angular protection is justified by the fact that SkyBridge does not operate at low elevation angles, to protect the FS services in other bands.

	Northpoint	SkyBridge
EIRP (dBW)	32.15	-5 (per code)
Bandwidth (MHz)	30	22.6
Frequency (GHz)	12.5	12.5
Free Space Loss (dB)	-134.4 (@ 10 km)	-177.7 (@ 1457 km)
SkyBridge User Terminal Receive Antenna Gain (dBi)	7 (@ 10°)	36.1 (@ 0°)
Power at the SkyBridge User Terminal (dB(W/4kHz))	-134.0	-184.1
C/I (dB)	**-50.1 dB**	

The Northpoint carrier is therefore over 50 dB greater than the SkyBridge signal, which would not be acceptable to SkyBridge. Non-interference would require separation distances greater than 10 km, which does not appear practical based on the ubiquitous nature of both proposed systems. Furthermore, Northpoint's use of powers up to that specified in the experimental license would likely foreclose development of any other system in the subject band, and in fact will disastrously impact the existing DBS operators themselves, as demonstrated below.

3. Impact of Northpoint on DBS

Assuming that DCE's goal is to provide service to all homes within a Designated Market Area ("DMA") (for example the Corpus Christi DMA specified in the experimental license), the Northpoint transmitters (presumably a multiplicity for each DMA) will radiate into the backlobe and sidelobes of the DBS receivers. Moreover, there will be reflections of the Northpoint signal from other buildings, passing cars, etc. Therefore, strong reflected signals may enter the near-main lobe of the DBS receivers.

Northpoint is required, as a condition of its experimental license (see page 2) to inform "all residences within the 10 dB C/I ratio contours." Based on a 10 dB C/I protection level (a low threshold), and the power level cited in DCE's experimental license, one can work backward to compute the separation distance required to protect DBS systems from the Northpoint signal. For purposes of this analysis, the DBS system is assumed to have an operating EIRP of 50 dBW into user terminal antenna dishes of 45 cm.[11/] The backlobe antenna gain of the 45 cm antenna is -5 dBi.[12/] Based on these assumptions, the following table can be generated:[13/]

11/ This is derived from the DirecTV/USSB EIRP toward King Ranch, Texas, Northpoint's test site, for a single tube (120 W) operation. (The free space loss of -206.2 dB in the table is also based on the slant range to King Ranch from 101° W.L.) Lower EIRPs to other areas and from other satellite locations have not been considered. The Northpoint experiments are being carried out on a 630,000 acre ranch, which is virtually unpopulated (350 employees, according to information at http://caller.com./attract/king.htm). The site affords DCE a location providing essentially the highest elevation angle for DirecTV and USSB transmissions. A more meaningful test would be conducted in a more densely populated area with low elevation angles. DBS licensees may wish to make more detailed assessments of DCE's proposal based on more likely interference scenarios.

12/ While the backlobe is considered for the 101 W.L. location, there will also be DBS dishes pointed at other DBS orbits locations, such as 61.5 W.L. In these cases, the entry will be via the sidelobe, and the rejection will be lower.

13/ These calculations assume there are no reflections from movable or immovable objects into the near-mainlobe and that all Northpoint transmitters are somehow located behind all DBS receiving antennas.

	Northpoint	DBS
EIRP (dBW)	32.15	50
Bandwidth (MHz)	30	27
Frequency (GHz)	12.5	12.5
Free Space Loss (dB)	(see below)	-206.2
DBS Dish Receive Antenna Gain (dBi)	-5	33
Power at the DBS Dish (dB(W/4kHz))	-171.5	-161.5
C/I (dB)	10 dB	
Required Free Space Loss (dB)	-159.9	
Separation Distance (km)	47[14/]	

These calculations demonstrate that, if the DBS C/I is to be kept to less than 10 dB, the DBS receiver has to be out of the line of sight of (i.e., over the horizon from) the Northpoint transmitter. (The line of sight would be about 40 km.) As the Northpoint service is to be received at residences that also have DBS dishes, such a separation distance is clearly impractical.

B. The Northpoint System According to the DCE Patent

The DCE Patent paints a completely different picture of the Northpoint system from that suggested in the DCE Reply Comments. Rather than reusing DBS spectrum without interference (see DCE Reply Comments at 2), the DCE Patent

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14/ The separation distance is computed assuming a Northpoint transmitter height of at least 50 m, a receiver height of 20 m, and using the propagation methodology of ITU-R 452-5 for the tropospheric propagation (far field) and ITU-R 526-2 for the spherical propagation (medium field) (at 47 km, the station is within the spherical propagation area).

suggests a method for providing local broadcast signals that depends critically on exclusive use of a portion of the 12.2-12.7 GHz band (not surprising, given the analysis above).[15/] As stated in the DCE Patent, "[p]art of the DBS broadcasting spectrum may be withdrawn from satellite transmission use and instead dedicated for use with local channel signals transmitted from the terrestrial transmitter." DCE Patent at column 2, line 17. The Patent goes on to explain that "approximately ten percent (10%) of the satellite broadcast frequency band will preferably be vacated for the converted local channel signals." Id. at line 54.

Ten percent of the DBS spectrum corresponds to 50 MHz of spectrum of each polarization. In effect, this version of Northpoint would require DBS operators to give up at least four out of 32 transponders. Considering signal compression, this corresponds to dozens of video channels per DBS system.

1. Impact of SkyBridge on Northpoint

According to the DCE Patent, the Northpoint receiving antenna could take many forms (see, e.g., DCE Patent, column 5, lines 29-39; column 6, lines 40-47), including a horn antenna (similar to that described in column 5, lines 44-45) or a slot antenna (column 5, lines 47-49). Based on a 0.5 square inch horn opening, the Northpoint user antenna gain would be about 7.0 dBi. Such a low gain means that the signal received from SkyBridge transmissions will be reduced below that into a

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15/ As noted above, SkyBridge does not know whether the technology proposed in the DCE Patent bears any resemblance to the current Northpoint experimental system. However, in the absence of any concrete explanation of its system by Northpoint, SkyBridge is forced to consider all the possibilities, especially as the DCE Reply Comments specifically refer to its Patent.

45 cm DBS antenna.[16/] It is logical to conclude that, because the SkyBridge signal is far below the DBS noise floor (see SkyBridge Amendment at Appendix C, page 6), it will be even further below the Northpoint noise floor. Because the modulations used by a DBS system and Northpoint are the same (column 2, lines 37-38), the same I/N ratio applies to both services.

2. Impact of Northpoint on SkyBridge

As discussed above, SkyBridge's user terminals will, from time to time, point within 10° of the horizon. If they are located near one of the many Northpoint towers, they will receive strong interference.

3. Impact of Northpoint on DBS

As noted above, under the scenario outlined in the DCE patent, DBS licensees would not receive interference from Northpoint; they would, instead, surrender about 10% of their licensed spectrum to Northpoint for its exclusive use. SkyBridge cannot assess the impact of such a loss on any particular DBS licensee's business plans.

CONCLUSION

DCE proposes a system that appears to be incapable of sharing spectrum with even the DBS licensees already operating in the subject band. SkyBridge's Petition, on the other hand, affords the Commission the opportunity to chart the course for an entirely new generation of satellite systems that do not require

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16/ Assuming a typical horn antenna with a 0.5 square inch opening, the DCE antenna gain of about 7.0 dBi would be 26 dB lower than the 33 dBi antenna gain of a 45 cm DBS antenna. The total difference from the 1.8 m FS antenna therefore is 38 dB.

an exclusive reservation of scarce spectrum resources, and which can utilize the vast amount of space beyond the GSO orbit that is presently unused. DCE's Reply Comments fail to offer any credible reason for delaying consideration of the issues raised in the Petition. The public interest would be greatly served by an expeditious rulemaking to permit NGSO FSS systems to operate co-frequency with GSO and terrestrial services at Ku-band, subject to regulations which ensure protection of those services.

Respectfully submitted,

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Dated: October 15, 1997

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I hereby certify that a copy of the foregoing Surreply of SkyBridge L.L.C. was sent this 15th day of October, 1997, via first-class mail, postage prepaid, to the following:

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